

CLOSED LOOP ADDRESSABLE ADVERTISING SYSTEM
AND METHOD OF OPERATION

TECHNICAL FIELD OF THE INVENTION

5
ins
A1

The present invention is directed, in general, to television, radio and Internet broadcast systems and, more specifically, to a system for replacing the regular advertisements in a broadcast video signal with audience-specific advertisements.

10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535
540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995
1000
1005
1010
1015
1020
1025
1030
1035
1040
1045
1050
1055
1060
1065
1070
1075
1080
1085
1090
1095
1100
1105
1110
1115
1120
1125
1130
1135
1140
1145
1150
1155
1160
1165
1170
1175
1180
1185
1190
1195
1200
1205
1210
1215
1220
1225
1230
1235
1240
1245
1250
1255
1260
1265
1270
1275
1280
1285
1290
1295
1300
1305
1310
1315
1320
1325
1330
1335
1340
1345
1350
1355
1360
1365
1370
1375
1380
1385
1390
1395
1400
1405
1410
1415
1420
1425
1430
1435
1440
1445
1450
1455
1460
1465
1470
1475
1480
1485
1490
1495
1500
1505
1510
1515
1520
1525
1530
1535
1540
1545
1550
1555
1560
1565
1570
1575
1580
1585
1590
1595
1600
1605
1610
1615
1620
1625
1630
1635
1640
1645
1650
1655
1660
1665
1670
1675
1680
1685
1690
1695
1700
1705
1710
1715
1720
1725
1730
1735
1740
1745
1750
1755
1760
1765
1770
1775
1780
1785
1790
1795
1800
1805
1810
1815
1820
1825
1830
1835
1840
1845
1850
1855
1860
1865
1870
1875
1880
1885
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
2075
2080
2085
2090
2095
2100
2105
2110
2115
2120
2125
2130
2135
2140
2145
2150
2155
2160
2165
2170
2175
2180
2185
2190
2195
2200
2205
2210
2215
2220
2225
2230
2235
2240
2245
2250
2255
2260
2265
2270
2275
2280
2285
2290
2295
2300
2305
2310
2315
2320
2325
2330
2335
2340
2345
2350
2355
2360
2365
2370
2375
2380
2385
2390
2395
2400
2405
2410
2415
2420
2425
2430
2435
2440
2445
2450
2455
2460
2465
2470
2475
2480
2485
2490
2495
2500
2505
2510
2515
2520
2525
2530
2535
2540
2545
2550
2555
2560
2565
2570
2575
2580
2585
2590
2595
2600
2605
2610
2615
2620
2625
2630
2635
2640
2645
2650
2655
2660
2665
2670
2675
2680
2685
2690
2695
2700
2705
2710
2715
2720
2725
2730
2735
2740
2745
2750
2755
2760
2765
2770
2775
2780
2785
2790
2795
2800
2805
2810
2815
2820
2825
2830
2835
2840
2845
2850
2855
2860
2865
2870
2875
2880
2885
2890
2895
2900
2905
2910
2915
2920
2925
2930
2935
2940
2945
2950
2955
2960
2965
2970
2975
2980
2985
2990
2995
3000
3005
3010
3015
3020
3025
3030
3035
3040
3045
3050
3055
3060
3065
3070
3075
3080
3085
3090
3095
3100
3105
3110
3115
3120
3125
3130
3135
3140
3145
3150
3155
3160
3165
3170
3175
3180
3185
3190
3195
3200
3205
3210
3215
3220
3225
3230
3235
3240
3245
3250
3255
3260
3265
3270
3275
3280
3285
3290
3295
3300
3305
3310
3315
3320
3325
3330
3335
3340
3345
3350
3355
3360
3365
3370
3375
3380
3385
3390
3395
3400
3405
3410
3415
3420
3425
3430
3435
3440
3445
3450
3455
3460
3465
3470
3475
3480
3485
3490
3495
3500
3505
3510
3515
3520
3525
3530
3535
3540
3545
3550
3555
3560
3565
3570
3575
3580
3585
3590
3595
3600
3605
3610
3615
3620
3625
3630
3635
3640
3645
3650
3655
3660
3665
3670
3675
3680
3685
3690
3695
3700
3705
3710
3715
3720
3725
3730
3735
3740
3745
3750
3755
3760
3765
3770
3775
3780
3785
3790
3795
3800
3805
3810
3815
3820
3825
3830
3835
3840
3845
3850
3855
3860
3865
3870
3875
3880
3885
3890
3895
3900
3905
3910
3915
3920
3925
3930
3935
3940
3945
3950
3955
3960
3965
3970
3975
3980
3985
3990
3995
4000
4005
4010
4015
4020
4025
4030
4035
4040
4045
4050
4055
4060
4065
4070
4075
4080
4085
4090
4095
4100
4105
4110
4115
4120
4125
4130
4135
4140
4145
4150
4155
4160
4165
4170
4175
4180
4185
4190
4195
4200
4205
4210
4215
4220
4225
4230
4235
4240
4245
4250
4255
4260
4265
4270
4275
4280
4285
4290
4295
4300
4305
4310
4315
4320
4325
4330
4335
4340
4345
4350
4355
4360
4365
4370
4375
4380
4385
4390
4395
4400
4405
4410
4415
4420
4425
4430
4435
4440
4445
4450
4455
4460
4465
4470
4475
4480
4485
4490
4495
4500
4505
4510
4515
4520
4525
4530
4535
4540
4545
4550
4555
4560
4565
4570
4575
4580
4585
4590
4595
4600
4605
4610
4615
4620
4625
4630
4635
4640
4645
4650
4655
4660
4665
4670
4675
4680
4685
4690
4695
4700
4705
4710
4715
4720
4725
4730
4735
4740
4745
4750
4755
4760
4765
4770
4775
4780
4785
4790
4795
4800
4805
4810
4815
4820
4825
4830
4835
4840
4845
4850
4855
4860
4865
4870
4875
4880
4885
4890
4895
4900
4905
4910
4915
4920
4925
4930
4935
4940
4945
4950
4955
4960
4965
4970
4975
4980
4985
4990
4995
5000
5005
5010
5015
5020
5025
5030
5035
5040
5045
5050
5055
5060
5065
5070
5075
5080
5085
5090
5095
5100
5105
5110
5115
5120
5125
5130
5135
5140
5145
5150
5155
5160
5165
5170
5175
5180
5185
5190
5195
5200
5205
5210
5215
5220
5225
5230
5235
5240
5245
5250
5255
5260
5265
5270
5275
5280
5285
5290
5295
5300
5305
5310
5315
5320
5325
5330
5335
5340
5345
5350
5355
5360
5365
5370
5375
5380
5385
5390
5395
5400
5405
5410
5415
5420
5425
5430
5435
5440
5445
5450
5455
5460
5465
5470
5475
5480
5485
5490
5495
5500
5505
5510
5515
5520
5525
5530
5535
5540
5545
5550
5555
5560
5565
5570
5575
5580
5585
5590
5595
5600
5605
5610
5615
5620
5625
5630
5635
5640
5645
5650
5655
5660
5665
5670
5675
5680
5685
5690
5695
5700
5705
5710
5715
5720
5725
5730
5735
5740
5745
5750
5755
5760
5765
5770
5775
5780
5785
5790
5795
5800
5805
5810
5815
5820
5825
5830
5835
5840
5845
5850
5855
5860
5865
5870
5875
5880
5885
5890
5895
5900
5905
5910
5915
5920
5925
5930
5935
5940
5945
5950
5955
5960
5965
5970
5975
5980
5985
5990
5995
6000
6005
6010
6015
6020
6025
6030
6035
6040
6045
6050
6055
6060
6065
6070
6075
6080
6085
6090
6095
6100
6105
6110
6115
6120
6125
6130
6135
6140
6145
6150
6155
6160
6165
6170
6175
6180
6185
6190
6195
6200
6205
6210
6215
6220
6225
6230
6235
6240
6245
6250
6255
6260
6265
6270
6275
6280
6285
6290
6295
6300
6305
6310
6315
6320
6325
6330
6335
6340
6345
6350
6355
6360
6365
6370
6375
6380
6385
6390
6395
6400
6405
6410
6415
6420
6425
6430
6435
6440
6445
6450
6455
6460
6465
6470
6475
6480
6485
6490
6495
6500
6505
6510
6515
6520
6525
6530
6535
6540
6545
6550
6555
6560
6565
6570
6575
6580
6585
6590
6595
6600
6605
6610
6615
6620
6625
6630
6635
6640
6645
6650
6655
6660
6665
6670
6675
6680
6685
6690
6695
6700
6705
6710
6715
6720
6725
6730
6735
6740
6745
6750
6755
6760
6765
6770
6775
6780
6785
6790
6795
6800
6805
6810
6815
6820
6825
6830
6835
6840
6845
6850
6855
6860
6865
6870
6875
6880
6885
6890
6895
6900
6905
6910
6915
6920
6925
6930
6935
6940
6945
6950
6955
6960
6965
6970
6975
6980
6985
6990
6995
7000
7005
7010
7015
7020
7025
7030
7035
7040
7045
7050
7055
7060
7065
7070
7075
7080
7085
7090
7095
7100
7105
7110
7115
7120
7125
7130
7135
7140
7145
7150
7155
7160
7165
7170
7175
7180
7185
7190
7195
7200
7205
7210
7215
7220
7225
7230
7235
7240
7245
7250
7255
7260
7265
7270
7275
7280
7285
7290
7295
7300
7305
7310
7315
7320
7325
7330
7335
7340
7345
7350
7355
7360
7365
7370
7375
7380
7385
7390
7395
7400
7405
7410
7415
7420
7425
7430
7435
7440
7445
7450
7455
7460
7465
7470
7475
7480
7485
7490
7495
7500
7505
7510
7515
7520
7525
7530
7535
7540
7545
7550
7555
7560
7565
7570
7575
7580
7585
7590
7595
7600
7605
7610
7615
7620
7625
7630
7635
7640
7645
7650
7655
7660
7665
7670
7675
7680
7685
7690
7695
7700
7705
7710
7715
7720
7725
7730
7735
7740
7745
7750
7755
7760
7765
7770
7775
7780
7785
7790
7795
7800
7805
7810
7815
7820
7825
7830
7835
7840
7845
7850
7855
7860
7865
7870
7875
7880
7885
7890
7895
7900
7905
7910
7915
7920
7925
7930
7935
7940
7945
7950
7955
7960
7965
7970
7975
7980
7985
7990
7995
8000
8005
8010
8015
8020
8025
8030
8035
8040
8045
8050
8055
8060
8065
8070
8075
8080
8085
8090
8095
8100
8105
8110
8115
8120
8125
8130
8135
8140
8145
8150
8155
8160
8165
8170
8175
8180
8185
8190
8195
8200
8205
8210
8215
8220
8225
8230
8235
8240
8245
8250
8255
8260
8265
8270
8275
8280
8285
8290
8295
8300
8305
8310
8315
8320
8325
8330
8335
8340
8345
8350
8355
8360
8365
8370
8375
8380
8385
8390
8395
8400
8405
8410
8415
8420
8425
8430
8435
8440
8445
8450
8455
8460
8465
8470
8475
8480
8485
8490
8495
8500
8505
8510
8515
8520
8525
8530
8535
8540
8545
8550
8555
8560
8565
8570
8575
8580
8585
8590
8595
8600
8605
8610
8615
8620
8625
8630
8635
8640
8645
8650
8655
8660
8665
8670
8675
8680
8685
8690
8695
8700
8705
8710
8715
8720
8725
8730
8735
8740
8745
8750
8755
8760
8765
8770
8775
8780
8785
8790
8795
8800
8805
8810
8815
8820
8825
8830
8835
8840
8845
8850
8855
8860
8865
8870
8875
8880
8885
8890
8895
8900
8905
8910
8915
8920
8925
8930
8935
8940
8945
8950
8955
8960
8965
8970
8975
8980
8985
8990
8995
9000
9005
9010
9015
9020
9025
9030
9035
9040
9045
9050
9055
9060
9065
9070
9075
9080
9085
9090
9095
9100
9105
9110
9115
9120
9125
9130
9135
9140
9145
9150
9155
9160
9165
9170
9175
9180
9185
9190
9195
9200
9205
9210
9215
9220
9225
9230
9235
9240
9245
9250
9255
9260
9265
9270
9275
9280
9285
9290
9295
9300
9305
9310
9315
9320
9325
9330
9335
9340
9345
9350
9355
9360
9365
9370
9375
9380
9385
9390
9395
9400
9405
9410
9415
9420
9425
9430
9435
9440
9445
9450
9455<br

viewer cost is higher. Advertisers are willing to do this because they believe the target audience is a better audience. For example, a luxury car dealer may advertise to a wealthier target audience that is able to afford its luxury cars by advertising only 5 in higher income residential areas.

Closed loop addressable advertising (CLAA) systems typically use a set-top box (STB) in the viewer's home to swap the original and substitute commercials advertisements. The set-top box tunes to a user-selected channel and transmits the regular broadcast television signal provided by the cable company to the television set. However, when a commercial break is about to occur in the regular broadcast television signal, the cable company transmits a special-purpose "swap" signal to the set-top box that causes the set-top box to tune to another channel in which audience-specific commercial advertisements are being broadcast. After one or more targeted commercials are played on the viewer's television set, a second swap signal causes the set-top box to tune back to the original regular broadcast television signal.

The closed loop nature of the CLAA system derives from the 20 fact that the set-top box (or some other peripheral device) is used to monitor the viewing habits of the viewer. The viewer information gathered in this manner is transmitted back to the

broadcaster in order to allow data mining and other purposes. The information collected is typically remote control data indicating viewer channel selections and time stamps indicating the time spent viewing each channel. The gathered data may then be sold to the 5 advertisers in order to target advertisements better and may be used to modify the viewing habits of the members of the household.

There are, however, drawbacks to the existing CLAA systems. Existing systems are bandwidth limited and one or more of a finite number of channels must be dedicated to the broadcast of the audience-specific commercial advertisements. The more audience-specific commercials that are added and the more groups that are targeted, the more bandwidth that is consumed. This leaves less channels available to carry the basic broadcast television programming.

There is therefore a need in the art for improved closed loop addressable advertising (CLAA) systems. In particular, there is a need for closed loop addressable advertising systems that provide a large number of audience-specific commercial advertisements while consuming only a minimum amount of the available television signal 20 bandwidth.

SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, it is a primary object of the present invention to provide an 5 addressable advertising system comprising: 1) receiver circuitry capable of receiving an incoming television signal from an external source or a local recorded source (e.g., VCR, DVD, and the like), generating therefrom a original baseband video signal, and transmitting the original baseband video signal to a display associated with the addressable advertising system; 2) a local storage device coupled to the receiver circuitry capable of storing a plurality of replacement video advertisements; and 3) an advertisement controller coupled to the receiver circuitry and the local storage device capable of detecting a first swap control signal transmitted in the incoming television signal, wherein the advertisement controller, in response to the detection, causes the receiver circuitry to receive from the local storage device a first selected replacement video (or audio or multimedia) advertisement and wherein the receiver circuitry generates therefrom a 20 replacement baseband video signal and transmits the replacement baseband video signal to the display.

According to one embodiment of the present invention, the

local storage device comprises at least one of a magnetic fixed disk drive, a digital versatile disk (DVD) drive, and a compact disk (CD) drive.

According to another embodiment of the present invention, the 5 local storage device is coupled to the addressable advertising system via a network connection.

According to still another embodiment of the present invention, the addressable advertising system further comprises a replacement advertisement download controller capable of receiving incoming replacement video advertisements from the external source and storing the incoming replacement video advertisements in the local storage device.

According to yet another embodiment of the present invention, the replacement advertisement download controller comprises an MPEG encoder circuit capable of receiving the incoming television signal and converting a first incoming replacement video advertisement transmitted in a first selected channel to MPEG data capable of being stored in the local storage device.

According to a further embodiment of the present invention, 20 the replacement advertisement download controller comprises a modem capable of receiving from a telephone network a first incoming replacement video advertisement and storing the first incoming

replacement video advertisement as MPEG data in the local storage device.

According to a still further embodiment of the present invention, the replacement advertisement download controller 5 receives the incoming replacement video advertisements at a predetermined time according to modifiable download time values stored in a memory associated with the advertisement controller.

According to a yet further embodiment of the present invention, the advertisement controller is further capable of detecting a second swap control signal transmitted in the incoming television signal, wherein the advertisement controller, in response to the detection of the second swap signal, causes the receiver circuitry to transmit the original baseband video signal to the display.

In one embodiment of the present invention, the advertisement controller is further capable of detecting a replacement advertisement selection signal transmitted in the incoming television signal, wherein the replacement advertisement selection signal comprises a data value identifying the first selected replacement video advertisement, and wherein the advertisement controller, in response to the detection of the replacement advertisement selection signal, causes the local storage device to

transmit the first selected replacement video advertisement to the receiver circuitry.

In another embodiment of the present invention, the receiver circuitry comprises a vertical blanking interval (VBI) decoder 5 capable of detecting the first swap control signal transmitted during a vertical blanking interval in the incoming television signal.

10 In still another embodiment of the present invention, the receiver circuitry further comprises a down-converter coupled to the vertical blanking interval decoder and capable of down-converting the incoming television signal to the original baseband video signal.

15 In yet another embodiment of the present invention, the receiver circuitry further comprises a multiplexer having a first input capable of receiving the original baseband video signal and a second input capable of receiving the replacement baseband video signal, wherein the multiplexer is controlled by the advertisement controller.

20 In a further embodiment of the present invention, the receiver circuitry comprises a video processor having a first input capable of receiving the incoming television signal and generating therefrom the original baseband video signal and a second input

capable of receiving the first selected replacement video advertisement and generating therefrom the replacement baseband video signal.

The foregoing has outlined rather broadly the features and 5 technical advantages of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they may readily use the conception and the specific embodiment disclosed as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

10
15

Before undertaking the DETAILED DESCRIPTION OF THE INVENTION, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms "include" and "comprise," as well as derivatives thereof, mean 20 inclusion without limitation; the term "or," is inclusive, meaning and/or; the phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included

within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller" means 5 any device, system or part thereof that controls at least one operation, such a device may be implemented in hardware, firmware or software, or some combination of at least two of the same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following 5 descriptions taken in conjunction with the accompanying drawings, wherein like numbers designate like objects, and in which:

FIGURE 1 illustrates an exemplary set-top box and television set according to one embodiment of the present invention;

FIGURE 2 illustrates in greater detail an exemplary set-top box according to one embodiment of the present invention;

FIGURE 3 illustrates in greater detail an exemplary set-top box according to another embodiment of the present invention;

FIGURE 4 illustrates in greater detail an exemplary set-top box according to still another embodiment of the present invention; and

FIGURE 5 is a flow diagram illustrating the operation of an exemplary set-top box according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGURES 1 through 5, discussed below, and the various embodiments used to describe the principles of the present invention in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the invention. Those skilled in the art will understand that the principles of the present invention may be implemented in any suitably arranged closed loop addressable advertising (CLAA) system.

FIGURE 1 illustrates television set 105 and exemplary set-top box 150 according to one embodiment of the present invention. Set-top box 150 receives incoming television signals from an external source, such as a cable television service provider (Cable Co.), a local antenna, the Internet, or a DVD or VHS tape player, and transmits a viewer-selected channel to television set 105. Set-top box 150 comprises infrared (IR) sensor 160 that receives commands (such as channel up, channel down, volume up, volume down) from a remote control device operated by the viewer. Television set 105 is a conventional television comprising screen 110, infrared (IR) sensor 115, and one or more manual controls 120 (indicated by a dotted line). IR sensor 115 also receives commands (such as volume

up, volume down, power ON/OFF) from a remote control device operated by the viewer.

As will be described below in greater detail, set-top box 150 detects special purpose signals in the incoming television signals 5 from the cable service provider. Each of the special purpose signals is a "swap" signal associated with a corresponding channel. The swap signal indicates that an original commercial advertisement is about to be shown on screen 110 on the corresponding channel. If the corresponding channel is being viewed by the operator of television 105 (i.e., the viewer selected channel transmitted to television 105), then set-top box 150 replaces the incoming original commercial advertisement with a replacement commercial advertisement that is retrieved from a local storage medium within, or coupled to, set-top box 150. A number of replacement commercial advertisements may be stored on the local storage medium by a variety of different means, as discussed below in greater detail. The viewer's selected channel is monitored even when a replacement advertisement is playing to determine if a subsequent switch is made.

20 It should be noted that set-top box 150 is not limited to receiving a particular type of incoming television signal from a particular type of source. As noted above, the external source may

be a cable service provider, a conventional RF broadcast antenna, a satellite dish, an Internet connection, or a local storage device such as DVD player or a VHS tape player. Therefore, the incoming signal may be a digital signal, an analog signal, or Internet protocol (IP) packets. Furthermore, in some embodiments of the present invention, the incoming signal may be a radio signal, such as a conventional AM or FM broadcast signal, that set-top box 150 transmits to an attached radio receiver. However, for the purposes of simplicity and clarity in explaining the principles of the present invention, the descriptions that follow shall generally be directed to an embodiment in which set-top box 150 receives incoming television signals (analog and/or digital) from a cable service provider. Nonetheless, those skilled in the art will understand that the principles of the present invention may readily be adapted for use with radio signals, wireless broadcast television signals, local storage systems, an incoming stream of IP packets containing MPEG data, and the like.

FIGURE 2 illustrates in greater detail exemplary set-top box 150A according to a first embodiment of the present invention. Set-top box 150A comprises vertical blanking interval (VBI) decoder 210, RF-to-super video (S-video) converter 220, multiplexer (MUX) 230, MPEG2 encoder 240, and hard disk drive 250. Set-top

box 150A also comprises MPEG2 decoder/NTSC encoder 260, advertisement (AD) controller 270, and memory 280. During normal operation (prior to start of an advertisement), VBI decoder 210 detects special purpose "swap" signals in the blanking intervals of 5 the incoming television signals from the cable service provider. VBI decoder 210 then notifies advertisement controller 270 of the receipt of each swap signal and the corresponding channel for each swap signal.

RF-to-super video converter 220 is a tuner/demodulator circuit that converts the channel selected by the viewer from a RF signal to a super video signal that is transmitted to television set 105 via multiplexer 230. Super video is a well-known technology for transmitting video signals over a cable by dividing the video information into two separate signals: one for color (chrominance or C) and one for brightness (luminance or Y). Transmitting the split signal produces sharper images than transmitting a single composite video (C-video) signal. The term Y/C video is sometimes used in place of super video. The use of super video signals in set-top box 150 is by way of example only. In alternate 20 embodiments of the present invention, RF-to-super video converter 220 in set-top box 150A may be replaced by an RF-to-C-video converter that converts the incoming RF signals to

composite video signals.

When VBI decoder 210 notifies advertisement controller 270 of the receipt of each swap signal and the corresponding channel, advertisement controller 270 compares the corresponding channel 5 information for each swap signal to the viewer-selected channel currently being viewed. If the corresponding channel matches the viewer-selected channel, advertisement controller 270 determines that an original incoming commercial advertisement is about to begin on the viewer-selected channel being played on television set 105.

In response thereto, advertisement controller 270 determines which video advertisement to swap in and sends a signal to hard disk drive 250 that selects the particular replacement commercial advertisement from a plurality of replacement advertisements stored as video clips on hard disk drive 250. For the purposes of this application and the claims that follow, hard disk drive 250 is defined to include any mass storage device that is both readable and writable, including conventional magnetic disk drives and optical disk drives for read/write digital versatile disks (DVD-RW), re-writable CD-ROMs, and the like. In fact, hard disk drive 250 need not be fixed in the conventional sense that is permanently embedded in set-top box 150. Rather, hard disk

drive 250 includes any mass storage device that is dedicated to set-top box 150 for the purpose of storing replacement advertisements. Thus, hard disk drive 250 may include an attached peripheral drive or removable disk drives (whether embedded or 5 attached), such as a juke box device that holds read/write DVDs or re-writable CD-ROMs. Furthermore, in an advantageous embodiment of the present invention, hard disk drive 250 may include external mass storage devices that set-top box 150 may access and control via a network connection (e.g., Internet protocol (IP) connection), including, for example, a disk drive in the user's home personal computer (PC) or a disk drive on a server at the user's Internet service provider (ISP).

Hard disk drive 250 then streams the selected replacement commercial advertisement to MPEG2 decoder/NTSC encoder 260, which converts the data from hard disk drive 250 to, for example, a super video signal suitable for transmission to television set 105. It should be noted that the choice of the MPEG-2 standard for the decoder portion of decoder/encoder 260 is by way of illustration only. In alternate embodiments of the present invention, the MPEG 20 decoder may comply with one or more of the MPEG-1, MPEG-2, MPEG-4, and MPEG-7 standards. Advertisement controller 270 also sends a control signal to multiplexer 230 that switches the output of MPEG2

decoder/NTSC encoder 260 to television set 105 at the start of the original commercial advertisement in the viewer-selected channel.

The replacement commercial advertisements on hard disk drive 250 are stored there by MPEG2 encoder 240. MPEG2 encoder 240 5 downloads replacement commercial advertisements from the cable service provider and converts the downloaded ads to MPEG format for storage on hard disk drive 250. In an exemplary embodiment of the present invention, MPEG2 encoder downloads the replacement advertisements from one or more system-defined channels at one or more predetermined times. For example, MPEG2 encoder 240 may tune to a public access channel at 2 AM every Saturday night in order to download advertisements from the cable service provider for the following week. By modifying the download time(s) and the download channel(s), the cable service provider can customize the replacement advertisements stored in hard disk drive 250 to suit the tastes of individual subscribers. Modified download time(s) and modified download channel(s) may be downloaded directly to MPEG2 decoder 240 and stored in memory 280. Alternatively, modified download times and channels may be downloaded through 20 advertisement controller 270 and then stored in memory 280.

Additionally, the cable service provider may further customize the replacement commercial advertisements by transmitting ad

selection commands to advertising controller 270. The ad selection commands, which may accompany the swap signals, are used by advertisement controller 270 to select particular replacement commercial advertisements from the available advertisements stored 5 on hard disk drive 250. In an advantageous embodiment of the present invention, MPEG2 encoder 240 may download a look-up swap table from the cable service provider each night. The look-up swap table identifies program times and channels that correspond to particular ad selection commands that may be transmitted to advertising controller 270. Thus, advertising controller 270 can receive a very simple command or data value that is used to locate a particular replacement advertisement entry in the look-up swap table.

10 FIGURE 3 illustrates in greater detail exemplary set-top box 150B according to a second embodiment of the present invention.

Set-top box 150B comprises vertical blanking interval (VBI) decoder 310, RF-to-super video (S-video) converter 320, multiplexer (MUX) 330, and digital versatile disk (DVD) 350. Set-top box 150B also comprises MPEG2 decoder/NTSC encoder 360, advertisement (AD) 20 controller 370, and memory 380. For the most part, set-top box 150B operates in the same manner as set-top box 150A described above in FIGURE 2. However, the replacement commercial

advertisements are stored on DVD 355 and are played by DVD player 350. The MPEG files retrieved from DVD 355 by DVD player 350 are transmitted to MPEG2 decoder/NTSC encoder 360 and converted to a television signal suitable for transmission to 5 television set 105. The cable service provider distributes the replacement commercial advertisements to subscribers by mailing DVD 355 to each subscriber on a periodic basis (weekly, bi-weekly, monthly, etc.)

FIGURE 4 illustrates in greater detail exemplary set-top box 150C according to a third embodiment of the present invention. Set-top box 150C comprises video processor 410, modem 440, hard disk drive 450, advertisement (AD) controller 470, and memory 480. For the most part, set-top box 150C operates in the same manner as set-top box 150A described above in FIGURE 2. Video processor 410, which may be, for example, a TriMedia (TM) 1100 media processor, contains front-end circuitry similar to VBI decoder 210 and RF-to-super video converter 220 for receiving incoming television signals from the cable service provider, tuning to a user-selected channel, and converting the selected RF signal to a baseband television 20 signal (e.g., super video signal) suitable for display on television set 105. Video processor 410 also contains MPEG decoder circuitry and NTSC encoding circuitry capable of converting the

MPEG output from hard disk drive 450 to a baseband television signal suitable for display on television set 105.

In response to advertisement swapping commands received from advertisement controller 470, video processor 410 can switch from 5 the incoming television signals from the cable service provider to the MPEG data streams coming from hard disk drive 450. Advertisement controller 470 receives the original swap signal transmitted by the cable service provider from the VBI decoder circuitry in video processor 410.

10 The replacement commercial advertisements on hard disk drive 450 are stored there by modem 440. Modem 440 downloads replacement commercial advertisements in MPEG format from the cable service provider via the public switched telephone network (PSTN). Modem 440 may load the replacement advertisements at one or more predetermined times or whenever the cable service provider dials 15 modem 440.

20 FIGURE 5 depicts flow diagram 500, which illustrates the operation of exemplary set-top box 150A according to one embodiment of the present invention. Initially, VBI decoder 210 and RF-to- super video converter 220 convert an incoming RF signal selected by the viewer to a baseband video signal that is transmitted to television set 105 (process step 505). At some point,

advertisement controller 270 detects a swap signal transmitted by the video company in the selected channel (process step 510). In response, advertisement controller 270 causes the local advertisement source, namely hard disk drive 250, to begin 5 streaming an MPEG video clip to MPEG2 decoder/NSC encoder 260 (process step 515). Advertisement controller 270 also switches multiplexer 230 to receive the replacement advertisement video signal from MPEG2 decoder/NSC encoder 260 and transmit it to television set 105 (process step 520). Finally, advertisement controller 270 switches multiplexer 230 back to receive the incoming video stream from RF-to super video converter 220 and transmit it to television set 105. Advertisement controller 270 switches multiplexer 230 back after a predetermined timeout period (i.e., the commercial duration) or after detection of a second swap 15 signal transmitted by the cable service provider (process step 525). Alternatively, advertisement controller 270 may cause the local advertisement source to begin streaming a second replacement advertisement to MPEG2 decoder/NSC encoder 260 when the second swap signal is received, thereby replacing a second original 20 video advertisement in the incoming video stream.

As noted above, the principles of the present invention may readily be adopted for use with a radio (AM or FM) signal that is

broadcast over the air in the conventional manner or is received from a local cable service provider. Many cable systems deliver radio broadcasts over televisions channels that display a test pattern or public information bulletin board on the television screen. However, STB 150 may also work in conjunction with, or be incorporated into, a radio receiver. In such an embodiment, the television receiver circuitry (e.g., VBI decoder 210 and RF-to-super video converter 220) is replaced by radio receiver front-end circuitry (e.g., low noise amplifier, tuner, and demodulation circuitry) and hard disk drive 250 stores audio data files that comprise replacement audio advertisements. The replacement advertisements are then transmitted to the audio speakers of the attached radio receiver in place of the original incoming radio signal.

Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.